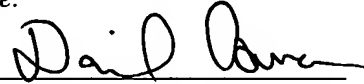


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GATE OR DOOR FRAME ASSEMBLY AND
METHOD OF MAKING A GATE OR DOOR

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TITLE OF THE INVENTION

[0001] GATE OR DOOR FRAME ASSEMBLY AND METHOD OF MAKING A GATE OR DOOR

CROSS-REFERENCE TO RELATED APPLICATIONS

[0002] Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0003] Not Applicable

REFERENCE TO A "SEQUENCE LISTING"

[0004] Not Applicable

FIELD OF INVENTION

[0005] The present invention relates to a frame assembly for use in the construction of gates or doors and, more specifically, to a frame assembly adapted to provide the vertical and horizontal support members of a gate or door and rotatably connect these members to a fixed structural member.

BACKGROUND OF INVENTION

[0006] Gates are used to allow selective access through a wall or fence. Conventionally, gates are constructed as follows. Two vertical support members and two horizontal support members are fastened together in a rectangular shape to form what will be referred to herein as a gate frame. Fence boards or the like are fastened to the support members, and one of the vertical support members is typically attached by two or more hinge assemblies to a structural

member such as a wall or post. Doors are similarly constructed with vertical and horizontal support members fastened together to form what will be referred to herein as a door frame. A sheet of plywood or the like covers one or both sides of the door frame.

[0007] Using conventional gate/door building techniques, fasteners such as nails or screws are driven through one support member into another support member to form the corners of the gate box. Over time, the force of gravity and wood shrinkage will cause these fasteners to loosen, allowing the gate/door frame to sag out of its desired rectangular shape.

[0008] Accordingly, metal L-brackets, wooden brace members, triangular pieces of plywood, and the like are often fastened to the adjacent ends of the support members to strengthen the inside corners of the gate/door frame. In other situations, a wire is placed in tension between the upper proximal and lower distal corners of the gate/door frame to support the lower distal corner of the gate frame and thereby reduce sagging of the gate or door. Such bracing techniques are somewhat effective but the wire is aesthetically unappealing and can produce frayed ends which are potentially dangerous. In addition the bracing commonly employs fasteners that are susceptible to failure and it can be relatively time consuming to implement.

[0009] Another problem with conventional gate/door building techniques is that fasteners such as nails or screws are similarly used to attach the hinge assemblies to the vertical support member adjacent to the structural member. The loads are transferred to the gate/door through the screws placed in tension. As the wood shrinks and the gate/door is opened and closed, the fasteners under tension tend to loosen and may eventually fail.

[0010] As the hinge fasteners loosen, the entire gate/door assembly may sag relative to the hinge assemblies and the structural members, even if the

gate/door frame maintains its rectangular shape. The use of braces at the corners of the gate/door frame will worsen sagging at the hinges because the materials and hardware used for bracing increase the weight of the gate/door; this increased weight increases the forces of gravity on the fasteners used to attach the hinge assemblies to the proximal vertical support member.

[0011] Various solutions have been proposed. One attempt was a steel gate frame product comprising distal and proximal brace members, with hinges being attached to the proximal brace member. A gate assembly constructed using this product would use upper and lower horizontal wooden support members, but would not use vertical support members. Instead, the distal and proximal brace members would form the structure of the vertical sides of the gate. The product required a plurality of sizes, with each size corresponding to a given distance between the upper and lower horizontal support members. The finished gate has excessive flex along the vertical plane of the gate. This flexing can cause the gate to twist making installation difficult. Exposed metal bracing are subject to rust and are aesthetically unattractive.

[0012] Another proposed solution was a set of four metal brackets as shown in Canadian Industrial Design Registration No. 83049 and 83050. These registrations describe a bracket system for forming gate assemblies. Four separate brace members are provided, and two of the brace members are rigidly attached to hinge assemblies. The brace members are adapted to be attached to support members to form the corners of a gate frame functioning as the structural portion of the gate assembly. The hinge assemblies are adapted to be rigidly attached to a fence post to allow the gate assembly to pivot relative to the fence post. Gate assemblies of arbitrary height and width can be formed using this bracket system although wooden members must be trimmed to accommodate weld filets of the brackets. As there is no direct connection between the horizontal and vertical wooden support members they can over time twist and warp independently of each other. While the finished gate is extremely

rigid, light weight and flex resistant, exposed metal bracing and parts are subject to rust and are unattractive. Costs of manufacture, quality control at welded connections and shipping costs are additional problems associated with this product.

[0013] From the foregoing, it should be clear that one object of the present invention is to develop a method and frame for making a gate or door that is easy and inexpensive to use, and which allow significant flexibility in the final design of the gate or door assembly.

SUMMARY OF THE INVENTION

[0014] It is an object of the invention to provide a frame for making a gate or door that is extremely rigid, light weight, flex resistant and with a minimum of exposed metal bracing and parts.

[0015] A further object of the present invention is to provide a frame for making a gate or door with improved method of securing the hinges to the frame.

[0016] Thus in accordance with the present invention there is provided a frame assembly for making a gate or door comprising an upper horizontal member, a lower horizontal member, a first vertical member and a second vertical member, one or more support members provided along the length of each of the upper and lower horizontal members, first connection means to connect an upper end of the first vertical to one end of support member provided along the length of the upper horizontal member, second connection means to connect lower end of the first vertical to one end of support member provided along the length of the lower horizontal member, third connection means to connect an upper end of the second vertical to a second end of support member provided along the length of the upper horizontal member and fourth connection means to connect a lower end of the second vertical to a second end of support

member provided along the length of the lower horizontal member.

[0017] Further features of the invention will be described or will become apparent in the course of the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Preferred embodiments of the invention are shown in the drawings, wherein:

[0019] Figure 1 is a perspective view of an assembly drawing for a frame assembly for making a gate or door in accordance with the present invention.

[0020] Figure 2 is a front plan view of the horizontal and vertical members of the frame assembly of Figure 1.

[0021] Figure 3 is an enlarged view of a hinge attachment detail of the frame assembly of Figure 1.

[0022] Figure 4 is an enlarged perspective view of a portion of a horizontal member of Figure 3 with a groove to accept a support rod.

[0023] Figure 5 is an end plan view of the horizontal member of Figure 4 with the support rod inserted.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] With reference to Figure 1, one embodiment of a frame assembly for making a gate or door in accordance with the present invention is generally indicated at 1. The frame assembly comprises an upper horizontal member 2, a lower horizontal member 3, a first vertical member 4 and a second vertical member 5. In the preferred embodiment illustrated when assembled, the

horizontal 2, 3 and vertical 4, 5 members form a rectangular frame.

[0025] One or more support members are provided along the length of each of the upper and lower horizontal members to strengthen the resulting frame and prevent sagging. In the embodiment shown support rod 6 is provided along the length of the upper horizontal member 2. In the embodiment shown (see Figures 2, 4 and 5), provision is made for one support rod, provided it has sufficient cross section to provide the strength required to support the frame assembly. The support rod 6 preferably is a steel rod with a cross section of at least $\frac{1}{4}$ inch. In order to connect the support rod 6 to the upper horizontal member 2 so that it is strengthened against sagging by support rod 6, a longitudinal hole or bore 7 is provided along the length of the upper horizontal member 2. The hole or bore 7 can be drilled or provided in some other manner. In the embodiment shown, hole or bore 7 is formed by making a groove 8 half the thickness of the upper horizontal member 2 in the face 9 of upper horizontal member 2 along its length. In the embodiment shown the upper and lower horizontal members 2, 3 have nominal dimensions of 1.5 x 3.5 x 48 inches. Groove 8 is $\frac{5}{16}$ inches wide by $\frac{3}{4}$ inches deep. A filler strip 10 is placed into the mouth 11 of groove 8 to form hole or bore 7. In the example shown filler strip 10 is $\frac{5}{16}$ inches wide by $\frac{3}{8}$ inches deep. Hole or bore 7 is sized and shaped to permit support rod 6 to pass through it. In the embodiment shown support rod 6 is a threaded $\frac{5}{16}$ inch steel rod.

[0026] Other materials and dimensions for the support member are possible so long as it provides the necessary support to the frame assembly. The support member could be a thin flat section inserted in saw curfs in the horizontal and vertical members. Another alternative is the use of U-shaped metal inserts or tubes that act as a receiver for a threaded rod or bolt used to attach the hinge.

[0027] The lower horizontal member 3 is similarly provided with a support rod 12.

[0028] Connection means are provided to connect the upper and lower ends of the first and second vertical members to opposite ends of the support members provided along the length of the upper and lower horizontal members.

[0029] In the embodiment shown, each of the first and second vertical members 4, 5 are provided with a plurality of horizontal holes. The upper end 13 of vertical member 4 is provided with at least one horizontal hole 14 sized and located to permit support rod 6 to pass through. If a second support rod is provided in upper horizontal member 2, a second horizontal hole can be located in the upper end 13 of vertical member 4 to permit the second rod to pass through. The upper end 15 of vertical member 5 is similarly provided with at least one horizontal hole 16 sized and located to permit support rod 6 to pass through. If a second support rod is provided in upper horizontal member 2, a second horizontal hole can be located in the upper end 15 of vertical member 5 to permit the second rod to pass through.

[0030] The lower end 17 of the vertical member 4 is provided with at least one horizontal hole 18 sized and located to permit support rod 12 to pass through. In the preferred embodiment a plurality of horizontal holes 18 are provided in the lower end 17 at six inch intervals to permit the length of vertical member 4 to be adjusted to accommodate different sizes of frame assembly. Similarly the lower end 19 of vertical member 5 is provided with at least one horizontal hole 20 sized and located to permit support rod 12 to pass through. In the preferred embodiment a plurality of horizontal holes 20 are provided in the lower end 19 at six inch intervals to permit the length of vertical member 5 to be adjusted to accommodate different sizes of frame assembly. In the embodiment shown the first and second vertical members 4, 5 have nominal dimensions of 1.5 x 3.5 x 72

inches before being cut to fit the opening.

[0031] In order to assemble the frame assembly 1 for making a gate or door in accordance with the present invention, support rods 6 and 12 are removed from the upper and lower horizontal members 2, 3. The upper and lower horizontal members 2, 3 are cut to the desired length based on the width of the desired gate or door. Usually the width of the opening is measured ("rough opening") and the width of the finished frame assembly is calculated at one inch narrower than the rough opening. The length of the horizontal support member 2, 3 and the width of the two vertical support members 4, 5 should equal one inch narrower than the rough opening. For example, where the vertical support members are made from 2 x 4 lumber having nominal dimensions of 1.5 x 3.5 inches, the horizontal support members 2, 3 are cut eight inches narrower than the rough opening. Similarly the first and second vertical support members 4, 5 are cut to the desired length based on the height of the desired gate or door. Typically this desired height is height of the fence or door opening less clearance required at the bottom to permit the gate or door to open and close. The vertical support members, as noted, are preferably predrilled with horizontal holes at six inch intervals to accommodate various sizes of gates. In the preferred embodiment the frame assembly is designed to build gates or doors from three feet to six feet high, the normal maximum required. Anything shorter than three feet typically does not require the added strength provided by the present invention. If a gate of a height does not meet the predrilled holes, for example a gate fifty two inches high, the verticals can be cut using the holes drilled at forty-eight inches and the fence boards can hang down below the lower horizontal support member.

[0032] Support rod 6 is inserted through the hole 14 in the upper end of vertical member 4, through the hole or bore 7 in upper horizontal member 2 and hole 16 in the upper end of vertical member 5. Support rod 12 is inserted through the hole 18 in the lower end of vertical member 4, through the hole or

bore 7 in lower horizontal member 3 and hole 20 in the lower end of vertical member 5. Hinges 21, 22 are connected to one end 23, 24 of support rods 6 and 12 respectively. The end 23 of support rod 6 extending through vertical member 4 passes through a first hole 25 in hinge 21. A threaded insert nut 26 or other suitable means can be used to fasten hinge 21 to the outer side 27 of the upper end 13 of vertical member 4. If two support rods are used with the upper horizontal member, the end of the second support rod would pass through a second hole 28 on hinge 21 and be secured by a threaded insert nut or other suitable means. Where only one support rod 6 is utilized, as shown in Figure 3, a lag screw 29 or other suitable fastener can be screwed through the second hole 28 in hinge 21 into the outer side 27 of the upper end 13 of vertical member 4 and into the end of the upper horizontal member 2. A pilot hole 37 in the vertical member 4 can be predrilled.

[0033] The other end 31 of support rod 6 extending through vertical member 5 is secured with a threaded end cap fastener and tightened to snug the vertical members 4, 5 to the upper horizontal member 2. If two support rods are used with the upper horizontal member, the end of the second support rod would pass through a second hole in vertical member 4 and be secured by a threaded end cap fastener or other suitable means. Where only one support rod 6 is utilized a lag screw or other suitable fastener can be screwed through the vertical member 4 into the end of horizontal member 2.

[0034] The end 24 of support rod 12 extending through vertical member 5 passes through a first hole 30 in hinge 22. A threaded insert nut 40 or other suitable means can be used to fasten hinge 22 to the outer side 32 of the lower end 19 of vertical member 4. If two support rods are used with the upper horizontal member, the end of the second support rod would pass through a second hole 33 on hinge 22 and be secured by a threaded insert nut or other suitable means. Where only one support rod 12 is utilized, as shown in Figure 3 with respect to hinge 21, a lag screw 36 or other suitable fastener can be

screwed through the second hole in hinge 22 into the outer side 32 of the lower end 19 of vertical member 4 and into the end of the lower horizontal member 3. A pilot hole 38 can be predrilled in vertical member 5 to accommodate the lag screw 36. Hinges 21, 22 in the embodiment illustrated are standard 4 x 4 butt hinges.

[0035] The other end 34 of support rod 12 extending through vertical member 5 is secured with a threaded end cap fastener and tightened to snug the vertical members 4, 5 to the lower horizontal member 3. If two support rods are used with the lower horizontal member 3, the end of the second support rod would pass through a second hole in vertical member 5 and be secured by a threaded end cap or other suitable means. Where only one support rod 12 is utilized a lag screw or other suitable fastener can be screwed through the vertical member 5 into the end of lower horizontal member 3.

[0036] The end 23, 24 of support rods 6 and 12 can be threaded through the threaded insert nuts 26, 40 and when the hinges and frame are secured, the ends 23, 24 of support rods 6 and 12 projecting beyond the threaded insert nuts can be cut off.

[0037] The hinges can be attached to a fixed structural member such as a fence post or door jamb. The hinges can be located to have the gate swing in or out and a left or right opening gate or door.

[0038] Once the frame assembly is complete fence boards or facing material can be fastened to one or both sides of the frame assembly to complete the gate or door. Braces 35 can optionally be provided, if desired, in the inside corners of the assembled frame assembly 1 to provide additional rigidity.

[0039] The frame assembly is preferably provided as a complete kit to build a gate frame or door frame including all hardware and structural members. One kit

can build any normal sized gate or door. The present invention does not depend on steel brackets to provide strength but rather the support rods that run through the structural members and used to tie the whole frame assembly together. The present invention provides an extremely strong gate or door with no exposed steel parts to rust or corrode other than the hinges.

[0040] The design of the present invention is easier to use than the prior art bracket systems and builds a superior gate that will not twist or warp as is common due to the use of fencing lumber which is green (not kiln dried). The present invention can be used with horizontal and vertical members of different sizes and materials (including composite materials) without departing from the scope of the present invention.

[0041] In addition to garden or fence gates the present invention can be used to build odd sized doors for garden and storage sheds, cold cellars, basements, storage lockers or other applications that require a custom size of door.

[0042] Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.